XXIII. *Remarks on Captain Hutton's Paper "On the Reversion and Restoration of the Silkworm." By* Captain J. Mitchell, Superintendent of the Government Museum, Madras. (Communicated by the Secretary.)

[Read 6th November, 1865.]

The passage in Captain Hutton's Paper with which my remarks are concerned is as follows :—

"In the introductory remarks to my 'Monograph on the Genus *Attacus*,' I have shown, after Kirby and Spence and other authorities, that the gum from the reservoirs, being conveyed to the mouth by the constriction of certain muscles, passes through two small orifices in the lip, *and the two fibres thus formed, being taken up and twisted together by the hook-like processes in the mouth appointed to that office, become one fibre of silk on coming into contact with the cold external air.*"* (The Italics are mine.)

Now it is quite certain the authorities referred to by Captain Hutton could not have examined, with sufficient optical assistance, silk taken directly from the cocoon, or they would have seen that no such twisting takes place, but that the two filaments are laid side by side in the cocoon, and adhere together until separated by the solution of the gum in the process of manufacture. I have examined cocoons, and reeled raw silks, contained in the Museum Collection, and have, in every instance, found a double filament. But in bleached spun silk the filaments are single, because the gum which held them together has been washed away in the process of bleaching.

I have only the introduction to Kirby and Spence, which does not contain the information referred to by Captain Hutton, but I am aware that other writers, upon whose authority we *ought* to be able to rely, have stated that the silkworm spins a single thread—such, for instance, as T. R. Jones, at p. 297 of the first edition of his undoubtedly interesting work "A General Outline of the Animal Kingdom;" Dr. Carpenter, at p. 110 of the second volume of his "Zoology;" "The Micrographic Dictionary," at p. 360 of the first edition, article "Spinning Organs;" and there are probably other authorities that might be quoted who have said

* *Vide ante*, p. 159.

that the filament is single. A correct description of the way in which the silk is deposited in the cocoon will be found at p. 200 of Adams' Essays on the Microscope, published nearly seventy years since.

It is, I believe, commonly supposed that the silk spun by every species of silk-producer, that is usually manufactured, is alike in form; but that is not the case. All the ordinary silk that I have examined is cylindrical, or nearly so; but the common Tussah silk, from *Antheræa Paphia*, is flat, and I have satisfied myself that each filament consists of a large number of very fine fibres held together by some substance that makes it very difficult to separate them. I have, however, succeeded so far as to justify me in saying that the filament is compound, and that the finest fibres I have obtained measure about $\frac{1}{35000}$th of an inch in diameter.

The filaments spun by *Attacus Atlas* and *Actias Selene* also appear to be compound, but the structure is not so marked as in *Antheræa*, and I have not yet tried to separate their fibres.

The foregoing remarks on Tussah silk are founded on observations made some days since. I have just had time before closing this letter to re-examine some that have been in water for many days, and I find the filaments are gradually breaking up into their component fibres, and I hope they will eventually all separate and enable me to mount specimens for permanent record.

I have only to add that, having had occasion to write to Captain Hutton, I pointed out the mistake about the filament, and he said in reply, that if I had discovered the two filaments were laid side by side and not twisted, I ought to make the fact known, as at present the idea prevailed amongst Entomologists that the two fibres were twisted after issuing from the orifice in the lip.